

ABSTRACT

In order to realize high resolution and high picture quality of a solid-state imaging apparatus, a light-collecting device which is resistant to incident light incoming at a high-angle and a manufacturing method of the light-collecting device are provided.

The light-collecting device includes light-transmitting films 101 which form concentric circles wherein, in each area divided by a constant width 103 of the divided area in an in-plane direction, a sum of line widths of a width 103 in the divided area is different each other. In each divided area, outer radius/ inner radius of a light-transmitting film 101 may match outer radius/inner radius of the divided area. In each divided area, the sum of line widths is smaller than a sum of line widths in an adjacent inner divided area. The concentric zone model is a circle and the sum W of line widths of the light-transmitting films in the divided area satisfies the following equation of $W=a(1+m-n_1r^2/(2\lambda f))$, where a wavelength of incident light is λ , a focal length is f , a width of a divided area is a , an effective refractive index of a light-transmitting film is n_1 , and a Fresnel zone boundary is r_m , when the light-transmitting film in the divided area is with an inner radius r that is greater than r_m and smaller than r_{m+1} .